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AMERICAN CHESTNUT

...an American wood

American chestnut, once one of the most important commercial forest trees in Eastern United States, has been virtually eliminated by blight, a fungus disease introduced into this country from Asia. The disease was first reported at New York City in 1904 and by 1950 had spread throughout the range of the species. Attempts to check its spread failed. Searches for resistant American chestnuts were fruitless. The loss is immeasurable. American chestnut was valued as an ornamental. It was grown in orchards for nut production, and was unsurpassed as a forest tree. It grew rapidly, and the wood was light and durable, seasoned well, and was easily worked. It was the chief source of tannin in this country. Some chestnut is probably still produced from dead or downed timber, but quantities are so limited they are unrecorded.

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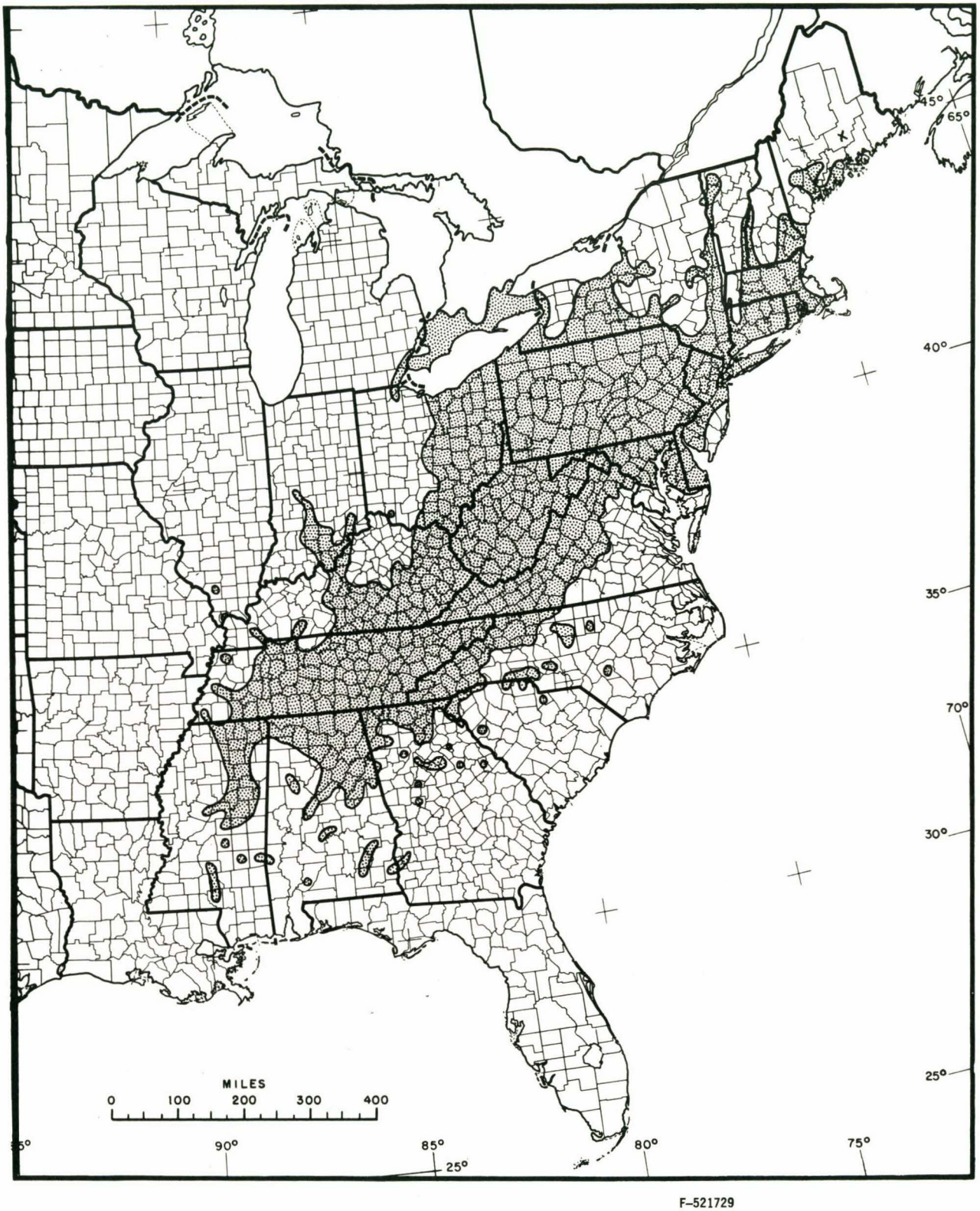

Figure 1.—Natural range of American chestnut.

AMERICAN CHESTNUT . . . an American wood

(*Castanea dentata* (Marsh.) Borkh.)

Joseph R. Saucier [1]

DISTRIBUTION

Before American chestnut was attacked by the blight, its range extended from central Maine west to southeastern Michigan, and south to northern Mississippi, Alabama, and Georgia (fig. 1). The major commercial stands were in southern New England and the Appalachian Mountains. The finest stands were in the southern Appalachians, where mature trees were generally 3 to 5 feet in diameter and 60 to 90 feet in height. Scattered specimens were as large as 7 feet in diameter and 120 feet high. Its ability to sprout vigorously from the stump has helped chestnut to exist in spite of continued attack by the fungus blight, which persists in living stumps and eventually kills the sprouts.

DESCRIPTION AND GROWTH

Although adapted to a variety of site conditions, American chestnut commonly grows on sandy loams in association with other hardwoods.

Before the blight, chestnut reproduced by stump sprouts as well as from seed. Sprout growth was fairly rapid. At 5 years of age, the average height of sprouts was 12 feet; at 10 years, it was 23 feet; and at 20 years of age, sprouts were 42 feet high and 6.8 inches in diameter.

The leaves of American chestnut are lance shaped and coarsely toothed, with the bristle-tipped teeth pointing forward sharply. They are about 2 inches wide and 5 to 8 inches long. The petiole is short and stout and is enlarged at the base (fig. 2).

Flowers are borne on ascending spikelike aments that are either staminate or bisexual. The staminate aments are about 5 inches long, and the flowers are in clusters of three to seven along the ament axis. Pistillate flowers are in clusters of two or three at the base of shorter bisexual aments. The fruit is an edible nut ½ to 1 inch in diameter. It is nearly flat on one side, and is borne in clusters of two or three in a bur covered with sharp, branched spines (fig. 3).

Twigs are slender to moderately stout. They are normally smooth, chestnut brown, and somewhat lustrous. The pith is star shaped. Lateral buds are about ¼ inch long, ovoid, brown, and have two or three visible scales. There are no terminal buds. The bark is dark brown and shallowly fissured into broad, flat ridges (fig. 4).

Mature trees reach a height of 60 to 90 feet and a diameter of 3 to 5 feet.

SUPPLY

In 1924 the volume of chestnut sawtimber was estimated at 19.3 billion board feet. Of this, probably 15 billion board feet was in the southern Appalachian Mountains where it made up about 25 percent of the timber volume. By 1940 virtually all chestnut had been killed by the blight. The blight does not damage the wood. Much of the dead timber was harvested during the onslaught of the disease, but great volumes remained standing for a number of years. The dead timber continued as the source of raw material for tannin extract until late in the 1950's, when the supply became too scarce and scattered to be harvested economically. In 1950 it was estimated that about 16 million long cords,[2] equivalent to 6 billion board feet, of standing and downed chestnut remained in the mountain sections of West Virginia, Virginia, North Carolina, Kentucky, Tennessee, and Georgia. Approximately half of this was accessible for logging. Only that timber previously considered inaccessible now remains.

PRODUCTION

The first reported production of chestnut lumber was 906.7 million board feet in 1899. The maximum yearly

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NOTE: This publication supersedes, "Chestnut," unnumbered, issued 1945.

[2] A long cord contains 160 cubic feet of stacked wood, while a standard cord contains 128 cubic feet.

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Figure 2.—Leaves and fruit of American chestnut.

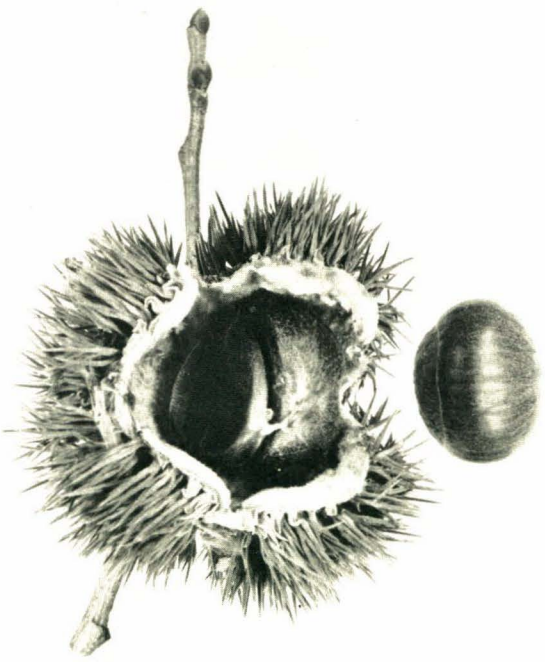

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Figure 3.—Fruit of American chestnut.

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Figure 4.—Bark of American chestnut.

cut of 663.9 million board feet was recorded in 1909. From 1909 to 1929 production fell irregularly to 269.9 million board feet. In 1933 it dropped to 50.5 million board feet, partly because of a business depression, but primarily because of the increasing effects of the blight. In 1943 production was 84.7 million board feet and has since decreased steadily. In 1960, 4.4 million board feet was cut from long-dead trees that were previously inaccessible.

In 1923, 55,301 tons of tannin extract were produced from approximately 632,000 long cords of chestnut wood—equivalent to 237 million board feet. Since then the annual production has never been as great, averaging 35,454 tons for the 10-year period 1930 to 1940. During World War II, the peak production of 48,601 tons was reported in 1942. Production declined rapidly after the war, primarily because of the scarcity of raw material. Production in 1950 was 14,448 tons.

In 1930,[3] 156,300 cords of chestnut went into pulpwood. Average annual consumption of chestnut pulp-

[3] The only year in which the consumption of chestnut pulpwood was compiled separately from other species.

wood in the years just before World War II is estimated roughly at 75,000 cords. During the war, use of chestnut pulpwood increased markedly and in 1944 was nearly 400,000 cords. Production decreased thereafter because the raw materials became scarce.

In 1908 telephone, telegraph, and electric-power companies purchased 516,000 chestnut poles. The number rose to 808,000 in 1928. This was more than 25 percent of the total of all poles purchased in that year. By 1931,[4] the use of chestnut poles had decreased markedly because of the blight, and chestnut was soon replaced on the market by preservative-treated poles of less durable species.

In 1908 approximately 8 million chestnut crossties were purchased for steam and electric railroads. In 1931,[5] only 115,000 were purchased, and chestnut for use as railroad ties has since been replaced by preservative-treated ties of other species, partly because of the blight, but also because other species were more suitable for this purpose.

In addition to the uses just discussed, chestnut was used in large amounts for fenceposts, shingles, barrel staves, and fuel.

No statistics are available on the quantity of nuts harvested annually, but it must have been considerable. The chestnut was a widely accepted nut when it was sold on street corners of all major cities in the East. The nut was also an important source of food for livestock and wildlife.

CHARACTERISTICS AND PROPERTIES

The heartwood of chestnut is grayish brown or brown and darkens with age. The narrow sapwood is almost white. The wood is coarse in texture, and the annual rings are made conspicuous by several rows of large, distinct pores at the beginning of each year's growth. While the wood resembles oak, it lacks wood rays characteristic of that species.

Chestnut wood is moderately light in weight.[6] It is intermediate in strength when used as a beam or post, is low in shock resistance, and has average hardness. Shrinkage is moderate. The wood is readily kiln dried or air seasoned with a minimum of warping, checking, or honeycombing. Chestnut is easy to work with tools and is in the group of woods most easily glued. Because it splits readily, chestnut requires care in nailing. In resistance to decay, chestnut is equal to the most durable woods, such as cedars, cypress, and redwood. The wood contains from 6 to 11 percent tannin.

[4] The latest year for which chestnut pole statistics are available.

[5] The latest year for which statistics on chestnut railroad ties are available.

[6] The average weight of air-dry chestnut (12 percent moisture) is 30 pounds per cubic foot.

PRINCIPAL USES

Chestnut has been used principally for lumber and for its tannin extract. Before its near extinction, it was the primary source of tannin for the leather industry. The extract is obtained by soaking the chipped wood in hot water and evaporating the resulting liquor until a concentration of about 25 percent is achieved. A long cord of wood will yield about 700 pounds of 25-percent extract. At some plants the spent chips were used in the manufacture of woodpulp.

Chestnut lumber has been used in general construction and in the manufacture of furniture, caskets, boxes, and crates, as well as for core stock in the manufacture of hardwood plywood, poles, railroad ties, pulpwood, shingles, barrel staves, mine timbers, and fuelwood. It has been used widely as fuelwood, partly because it split easily and ignited quickly. American chestnut, however, has been eliminated as a commercial species by the chestnut blight.

In the past, the nuts were gathered in large quantities throughout the range of the tree to be eaten raw or roasted. The nut was so widely accepted and in demand that the tree was grown profitably in orchards for nut production.

SEARCH FOR RESISTANT TREES

After the blight had progressively destroyed American chestnut for several years, and when hope of finding naturally resistant trees dimmed, foresters turned their attention to introduced Asiatic chestnut species. Based on outplanting tests in this country, none of these introduced species have proved to be immune, but several show natural resistance to the disease. The Chinese chestnut (*Castanea mollissima*) is the hardiest and most resistant when grown on the better sites, but it appears to be unable to cope with the fungus either when grown on the poorer sites or when damaged by cold.

The Asiatic species are not straight and tall as the American chestnut typically is. A breeding program to combine the blight resistance of the Asiatic species with the characteristic tree form and growth rate of the American chestnut was started by the U.S. Department of Agriculture in 1925 and by the Connecticut Agricultural Experiment Station in 1930. As a result of long and dedicated work by several men, including A. H. Graves, R. B. Clapper, and Jesse D. Diller, it is now known that blight resistance is probably controlled by two or more primary genes, and that there is an apparent linkage between high blight resistance and poor tree form. However, Graves and his associates have produced nine promising hybrids that have been described.

A backcross of one of Clapper's more resistant hybrids to the American parent produced progeny that

were outplanted in 15 test plantings over the natural range of chestnut. One such tree, the Clapper chestnut, has recently been written up as a new cultivated variety (cultivar) of chestnut. It is reportedly the most promising of more than 10,000 chestnut and chinkapin hybrids produced by Clapper. In 1963, after 17 growing seasons, this tree measured 45 feet in height and 7.3 inches in diameter at breast height. The tree has combined rapid growth with excellent form. It apparently has a high degree of blight resistance because chestnut blight is present in the plot.

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